Space Weather Technical Forecast

Issued on Tuesday, 27 August 2024 at 00:16 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

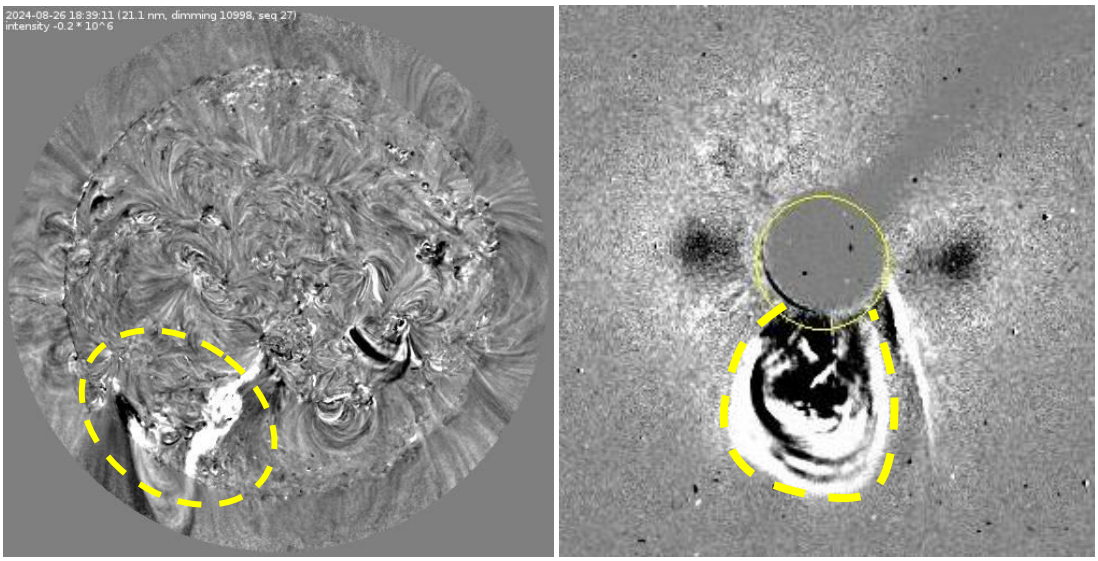
Space Weather Forecast Headline: Moderate Solar Activity with further M-class flares likely. Chance of G1 Minor Storm intervals Day 1 (27 Aug) from CME glancing blow.
Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Moderate in the last 24 hours, with a single M-class flare peaking at M1.4 at 26/1141UTC, originating from AR3796.

There are eleven sunspot regions on the visible disc. AR3800, near south-centre disc remains the most likely and notable flare source. It features a large leader spot followed by a series of smaller spots, including a weakening delta region on one of its intermediate spots. AR3790 in the southwest has historically been one of the larger regions, but has been relatively stable and remains a largely inactive region. AR3796 has recently shown slight growth of penumbra on some of its southern intermediate spots, where a weak delta spot has formed. AR3801 has shown recent growth, with minor spots emerging in its trailing portion. AR3803 and AR3804 have recently rotated over eastern limb and will need to rotate further onto the visible disc for a more thorough analysis. The remaining regions are either small or magnetically simple, and appear largely stable.

A dimming event seen in imagery at around 26/1830 UTC probably resulted in the bright and large CME seen emerging off the southwest disc in LASCO and STEREO-A imagery. However, no evidence of a flare associated with this event. Awaiting further imagery to a detailed analysis of this event.

Figure 0: SDO/AIA 211 shows a solar dimming event (left) and LASCO-C3 (right) imagery shows CME emerging off the south of the visible disc. Currently undergoing analysis.



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No Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: Slow wind conditions dominated. Solar wind speed, as measured by ACE at L1, was at background levels throughout, initially around 330km/s but has declined to current levels of 260km/s. Density was below average. Interplanetary Magnetic Field (IMF), Bt, was weak, around 2-5nT. The north-south component, Bz, varied weakly between -4nT and +2nT. Phi angle was mostly positive (away from the Sun), before re-orientating to negative (towards the Sun) from around 26/1600 UTC. Geomagnetic activity was Quiet (Kp0-2).

Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux observed by GOES18 remained at background. High energy electron flux (greater than 2MeV) observed at GOES16 was mainly at background, but did have a brief diurnal rise to moderate levels. The 24-hour fluence was below the Active threshold, with 3.26e6 integrated pfu observed at 27/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: M-class flares are expected with a slight chance of isolated X-flares.

Solar Wind /Geomagnetic Activity: A CME from the filament eruption near AR3794 just after 23/0100UTC has been assessed as passing mainly ahead of Earth, but with a glancing impact likely early Day 1 (27 Aug). Additionally, CH62/+ in centre disc may cause some slight enhancement to the solar wind later on Day 2 or early Day 3 (28-29 Aug).

Mainly Quiet geomagnetic activity is expected with occasional Unsettled spells, primarily due to the aforementioned glancing CME or coronal hole effects. There is a chance of Active to G1 Minor Storm if the glancing CME occurs, most likely early on Day 1 (27 Aug).

Energetic Particles / Solar Radiation: High energy proton flux is likely to remain at background, but with the potential to rise in response to any notable flares, giving a slight chance of reaching the S1 Minor Radiation Storm level. High energy electron flux is expected to remain at background levels. The associated 24-hour fluence is expected to persist below the Active level.

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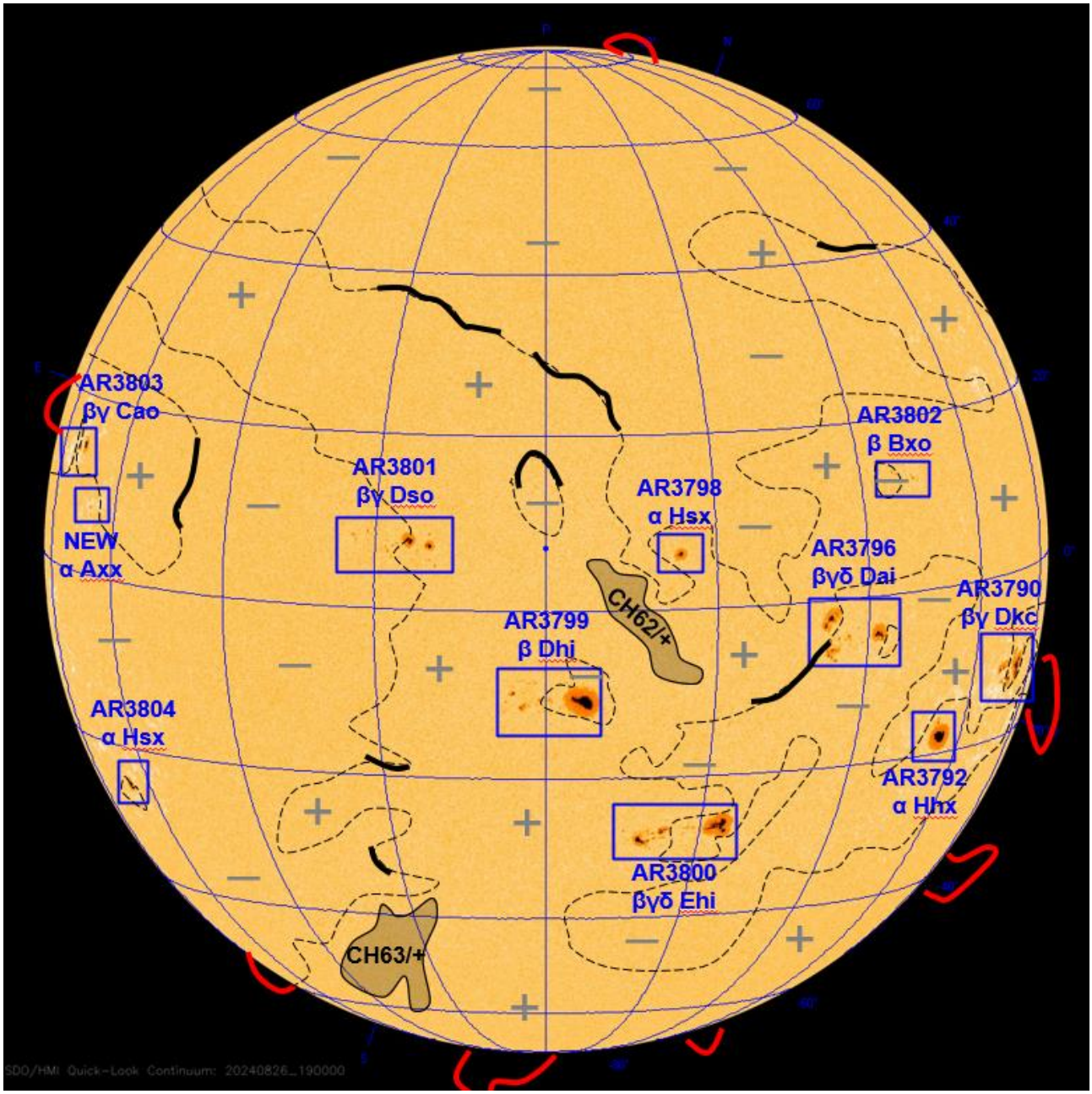
Figure 1. Solar Analysis Valid 26/1900 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A CME from a filament eruption near AR3794 just after 23/0100UTC, has been assessed as passing mainly ahead of Earth, but with a glancing arrival likely early Day 1 (27 Aug).

Coronal hole 62/+ in centre-disc may cause some slight enhancement to the solar wind later on Day 2 or early Day 3 (28-29 Aug). This coronal hole is persistent, but the forecast is somewhat uncertain due to contamination from previous CME impacts during the last solar rotation. While the MOSWOC ENLIL model predicts a slight enhancement a day earlier than expected, its forecast of only a very minor increase in solar wind is considered accurate.

Mainly Quiet geomagnetic activity is expected with occasional of Unsettled spells, primarily due to the aforementioned glancing CME or coronal hole effects. There is a chance of Active to G1 Minor Storm if the CME glance occurs, most likely on Day 1 (27 Aug).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	30	5	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
23/0858	Partial	C5 flare and filament eruption	NW, nr AR3794	416 km/s	27/0600 UTC +/-9hrs	Low confidence. Glancing impact likely

Figure 2: ENLIL and ensemble, showing glancing arrival of CME on Day 1 (27 Aug)

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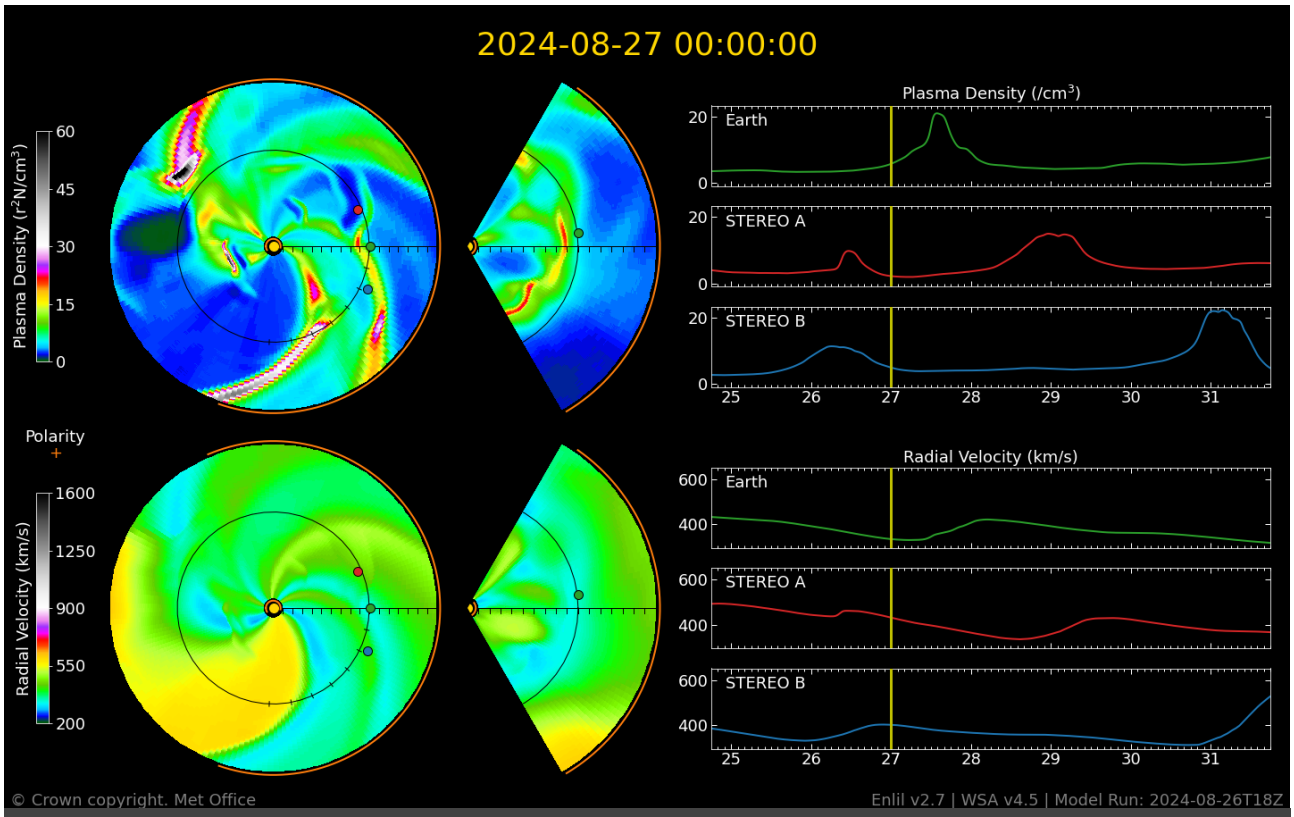

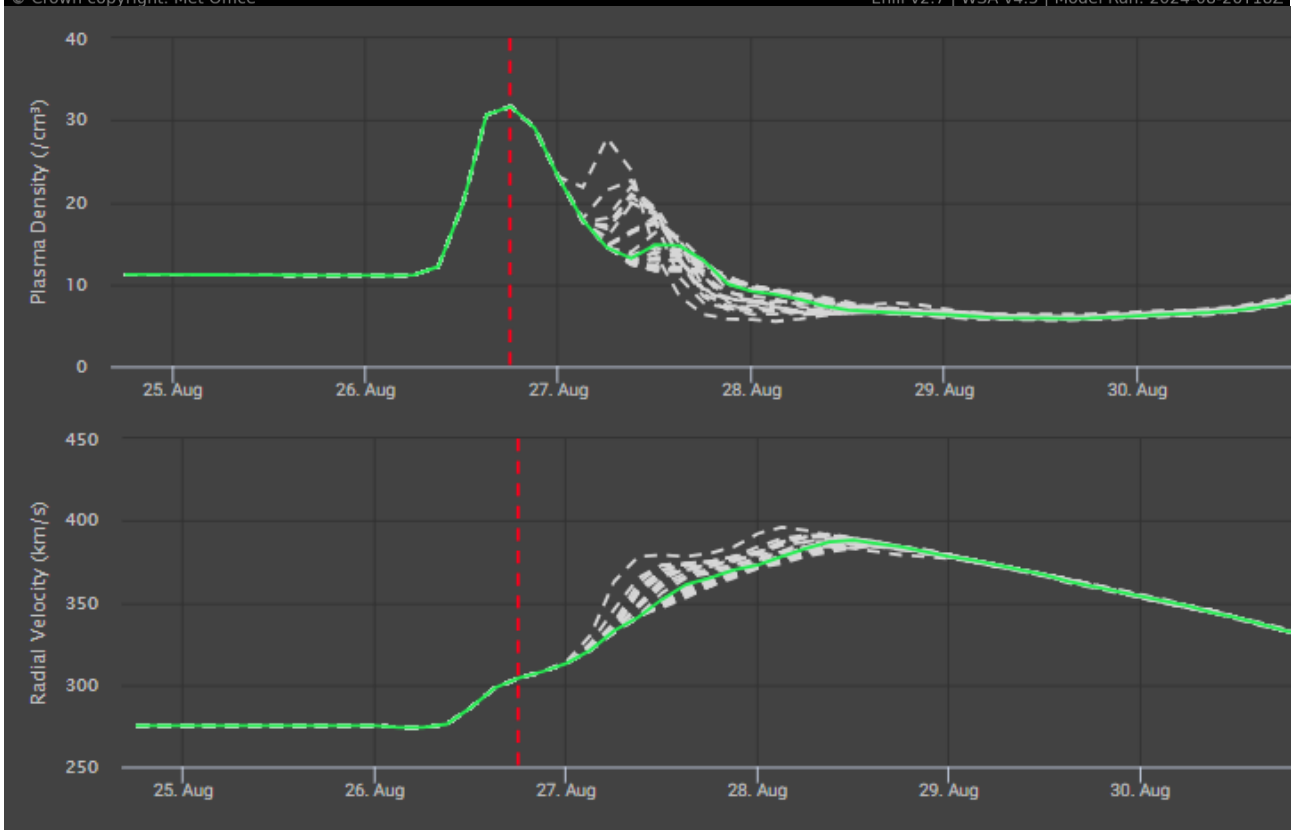

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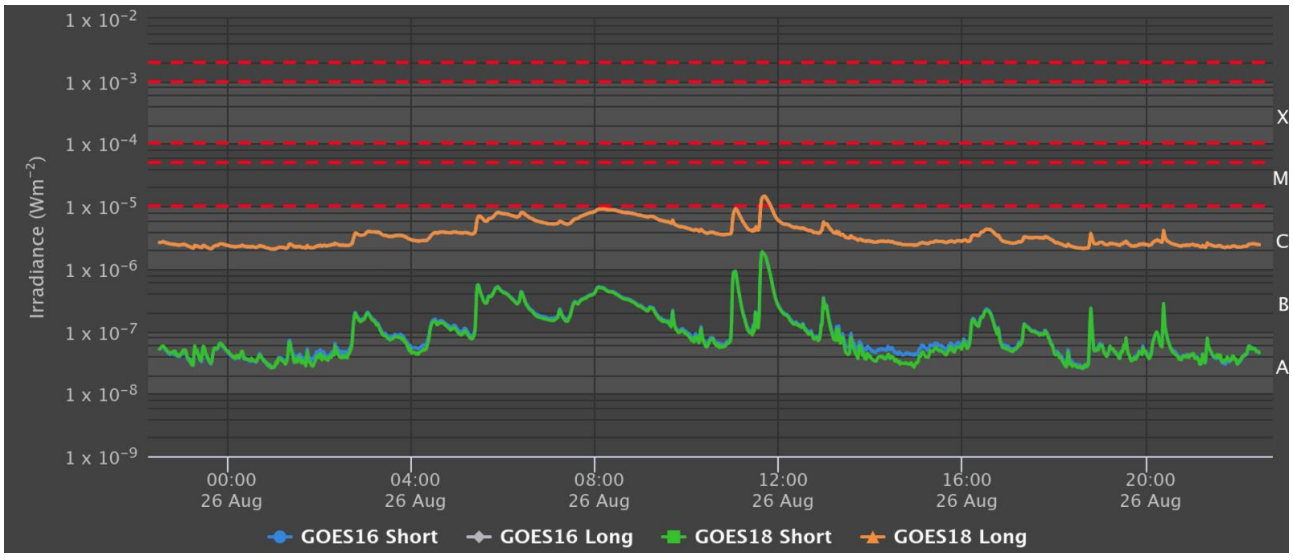
Radio Blackouts - X-Ray Flares:
Activity has been Moderate in the last 24 hours, with a single M-class flare peaking at M1.4 at 26/1141UTC, originating from AR3796. Further M-class flares are expected with a slight chance of isolated X-flares.

There are eleven regions on the visible disc. AR3800, near south-centre disc remains the most likely and notable flare source. It features a large leader spot followed by a series of smaller spots, including a weakening delta region on one of its intermediate spots. AR3790 in the southwest has historically been one of the larger regions, but has been relatively stable and remains a largely inactive region. AR3796 has recently shown slight growth of penumbra on some of its southern intermediate spots, where a weak delta spot has formed. AR3801 has shown recent growth, with minor spots emerging in its trailing portion. AR3803 and AR3804 have recently rotated over eastern limb and will need to rotate further onto the visible disc for a more thorough analysis. AR3794 in the northwest has rotated off the disc, where AR3794 has faded to plage.

The remaining regions are either small or magnetically simple, and appear largely stable.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X Class	No	10	10	10	10

Figure 3: GOES16-18 X-Ray trace



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Solar Radiation Storms - (High Energy Protons):

High energy proton flux, as observed by GOES-18, is currently at background and expected to persist at this level. There are a number of moderately sized sunspot regions on the disc, with occasional low M-flares likely. Furthermore, a number of these are now either in, or soon to move into the western hemisphere, where it is favourable for any erupted protons to subsequently be observed at Earth. However the regions currently lack complexity that is ordinarily associated with the more proton rich events. Consequently, there is a chance that proton flux will rise given any notable flares, however this only gives a slight chance of exceeding the S1 Minor Radiation Storm threshold.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	10	10	10	10
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

High Energy Electrons Event (≥ 2MeV):

High energy electron flux as observed by GOES-16 is currently at background and forecast to remain at this level, although likely with some moderate diurnal fluctuations.

Fluence is expected to remain below the Active (1e8 integrated pfu) threshold through the period. MOSWOC REFM is currently providing reasonable guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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